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Admin. Report

FOREST PEST MANAGEMENT

1982 FOREST PEST MANAGEMENT NURSERY REPORT

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INTRODUCTION

This report summarizes Forest Pest Management nursery activities in the St. Paul Field Office area during 1982. The nursery work includes direct involvement with federal nurseries, cooperative projects with states, universities, and other federal agencies. The Field Office also reponds to pest surveillance reports sent in by forest nursery managers within a six state area. Some of the nursery activities are described below:

- -Evaluating the effects of fumigation and solar pasteurization on seedling production
- -Surveying for endemic nursery mycorrhizae
- -Testing for arsenic toxicity of container grown red pine
- -Evaluating field performance of stunted white spruce
- -Element analyses of stunted and non-stunted nursery stock
- -Honeysuckle leaf blight
- -1982 nursery pest surveillance reports

EVALUATING OF THE EFFECTS OF FUMIGATION AND SOLAR PASTEURIZATION ON SEEDLING PRODUCTION

Because soil-borne microorganisms have caused large losses in forest tree nurseries, it has become a common practice to fumigate seed beds prior to sowing. Solar pasteurization of soil has recently been investigated as an alternative to fumigation for control of soil-borne pests in agricultural crops. The procedure relys on solar radiation to raise the temperature of polyethylene tarped soil to levels that reduce or eliminate pest populations.

A two year study to evaluate the effects of fumigation and solar pasteurization on nursery conifer production was begun in July, 1982 at the Iowa State Nursery in Ames. Saprophytic nematode populations were reduced by 58 and 100 percent in the top 15 cm of pasteurized and fumigated areas, respectively. However, at lower depths (16-30 cm), there was a 5 percent population increase for the pasteurized area and a 36 percent decrease for the fumigated area. Eight weeks after removing the tarps, there were fewer weeds in the pasteurized than in the control areas (weeds were not counted in fumigated areas). Although reductions in Fusarium populations were observed in both fumigated and pasteurized areas, these reductions were statistically significant in the fumigated areas only.

The treated areas were seeded in November, 1982. Seedling survival and growth will be evaluated in the fumigated, pasteurized, and control areas following the first growing season.

SURVEYING FOR ENDEMIC NURSERY MYCORRHIZAE

To identify species of known mycorrhizae-forming fungi occurring in regional forest tree nurseries, a three-year endemic mycorrhizae survey was initiated in 1980. Survey results are summarized below:

Ten different fungi were represented among the survey's 128 collections: Boletus sp., Entoloma sp., Hebeloma sp., Inocybe sp., Laccaria laccata (Fr.) Berk and Br., Pisolithus tinctorius (Pers.) Coker and Couch, Rhizopogon sp., Suillus sp., Thelephora terrestris Ehrh. ex Fr., and Tylopilus felleus (Bull. ex Fr.) Karst.

The fungus most frequently collected was L. laccata; there were 47 collections. There were 33 collections of Hebeloma sp., 21 of Inocybe sp., and 15 of T. terrestris. The greatest number of collections came from red pine, 48, followed by 31 from white spruce. Hebeloma sp., L. laccata and T. terrestris collections were made in association with six of the eight conifer species included in the survey. Inocybe collections were found with five. All other fungi occurred in association with a single species.

Hebeloma sp. was collected at all nine participating nurseries. L. laccata was found at 8, T. terrestris at 6, Incoybe sp. at 5, and Boletus sp. at 3. All other species were collected at only one nursery.

The survey was designed to reflect qualitative and not quantitative nursery mycorrhizae data. The collection frequency of the various fungal species does not necessarily indicate the relative importance in forming mycorrhizae with conifer hosts. There are two reasons for this: 1) the number of fruiting bodies a fungus produces may not be proportional to the number or effectiveness of mycorrhizae it forms with higher plants, and 2) brightly colored, persistent, and/or large fruit bodies are more likely to be collected than those lacking these characteristics.

Since L. laccata and T. terrestris are frequently noted in Lake States nursery beds, it is not surprising that many samples were collected. However, the large numbers and wide distribution of the Inocybe and Hebeloma were unexpected.

TESTING FOR ARSENIC TOXICITY OF CONTAINER GROWN RED PINE

In July, Bureau of Indian Affairs personnel asked the St. Paul Field Office to examine chlorotic and dead red pine seedlings from a paper pot container greenhouse facility for potential insect or disease damage. No pests were detected. Because

the affected seedlings were uniformly arranged along the perimeter of each paper pot set, it appeared that they might be adversely affected by the arsenic based wood preservative used to treat the box frames surrounding each set. An analysis of seedling tissues showed an average of 161 times more arsenic in the roots of the affected edge seedlings than in the non-affected seedlings from the box center. Comparison of shoot tissues also showed a higher arsenic level in the affected seedlings. Soil samples showed 18 times more arsenic at the edge than at the box center.

Based on these findings a formal evaluation of red pine response to arsenic treated wood products is currently underway at the Red Lake Forest Greenhouse, Redby, Minnesota.

EVALUATING FIELD PERFORMANCE OF STUNTED WHITE SPRUCE STOCK

In 1977, because of the frequency of seedling stunting, Region 9 asked the Field Office to conduct a survey to determine the impact of stunting on white spruce production at Eveleth Nursery. The survey results showed that 28 percent of the stunted 1-0 seedlings were culled at the 3-0 stage due to small size, resulting in a $9,800 loss to the nursery for the white spruce crop seeded in 1978.

Results also indicated that the average stunted seedling had attained only 78 percent of the height of non-stunted seedlings after three years in the nursery. However, as the nursery beds had been top pruned this percentage was not a true indication of the comparative actual height of the stunted and non-stunted trees. If stunted seedlings continue to lag behind their non-stunted counterparts after outplanting, stunting related financial losses would be even greater than the losses reported for the nursery.

To determine if the growth differential persists in the field, both stunted and non-stunted graded 3-0 white spruce stock were outplanted on the Superior National Forest, Minnesota in April. First year growth measurements showed no statistically significant difference in the height growth of the stunted and non-stunted seedlings. None of the non-stunted seedlings died while mortality was 3 percent among stunted stock. Final growth measurements will be made at the end of the second growing season.

ELEMENT ANALYSIS OF STUNTED AND NON-STUNTED NURSERY STOCK

Stunted white spruce and red pine stock have been commonly observed in many of Lake States Nurseries. Stunted 1-0 seedlings have purple foliage and are about half the height of

green non-stunted stock. Although the cause of the symptoms is unknown, the purple foliage suggests a phosphorus deficiency.

To determine if a phosphorus deficiency was associated with stunted regional stock, both stunted and non-stunted 1-0 white spruce and red pine seedlings were analyzed for phosphorus and several other elements. Foliage analyses of stock from General Andrews Nursery, Minnesota and Eveleth Nursery, Minnesota show stunted/non-stunted phosphorus ratios ranging from 0.27:1 to 0.50:1. The stunted seedlings also had consistantly lower potassium levels. Aluminum, iron, and lead levels were high in the stunted white spruce seedlings, with average ratios of 2.93:1, 2.65:1, and 1.75:1.

A similar series of element analysis samples is planned for next autumn.

HONEYSUCKLE LEAF BLIGHT

The Iowa State Nursery in Ames, experienced severe honeysuckle leaf blight infection on Lonicera tatarica during the 1982 growing season. This disease is caused by the fungus Herpobasidium deformans Gould. The fungus over winters on dead leaves where it produces basidiospores, which are thought to cause the primary infection as the young seedlings begin to develop in the spring. Infection results in browning of leaf tissue, premature leaf drop, and reduced growth.

The nursery estimated $8,000 was lost due to blight-related cull. Because of these severe losses, Forest Pest Management will help the nursery develop a protective fungicide spray program during the 1983 field season.

1982 NURSERY PEST SURVEILLANCE REPORTS

During 1982, nine requests for diagnosis of nursery pest problems were received. The requests are listed below by nursery, host species, and pest:

NURSERY	TREE SPECIES	PEST
General Andrews, Willow River, MN	Jack pine	Gall rust
Iowa State, Ames, IA	White pine and red pine	Unknown root rot
	Honeysuckle	Herpobasidium leaf blight
Red Lake Indian Res., MN	Red pine	Rhizoctonia root rot
	White pine	Unknown
	Red pine	Insect frass
	Red pine	Arsenic toxicity
Superior N.F., MN contract container stock	White spruce and black spruce	Frost injury
Toumey, Ottawa NF., MI	Hemlock and white spruce	Snow mold